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## Restoration Goals, Strategies, and Techniques: A Critical View

John A. Stanturf

Callie Jo Schweitzer

Center for Bottomland Hardwood Research

Southern Research Station

USDA Forest Service

P.O. Box 227

Stoneville, MS 38776

### Introduction

The predominant goal of bottomland hardwood restoration programs in the Delta, on both public and private land, has been to create wildlife habitat. In 1987 the Fish and Wildlife Service began an aggressive restoration program directed at wildlife refuges but also including private land. The Corps of Engineers mitigation programs are geared toward off-setting losses of fisheries and wildlife habitat. On private forest land, most landowners cite wildlife habitat as a major benefit of ownership. The federal Conservation Reserve Program (CRP) began in 1985 to subsidize establishing permanent cover on erosive and other fragile land such as wetlands, in order to improve water quality. Wildlife habitat creation and water quality improvement are goals of the Wetlands Reserve Program (WRP). No federal restoration program has a goal to provide financial return to the landowner. Indeed, these programs explicitly or implicitly discourage commodity production on restored lands. It would be fair to say that programs do not envision any silvicultural manipulation of restored stands beyond the establishment phase. While this lack of a future income stream may be sufficient for public land, we believe it limits the participation of private landowners. The point we most want to make in this presentation is that we need to think from the long-term perspective of the landowner, about managing the restored stand in perpetuity and try to not limit future options by planting understocked stands today.

### Objectives

Restoration goals are constrained by four factors: landowner objectives, the nature of available sites, technology available, and resources available. If a landowner primarily desires to create wildlife habitat, the question remains, What kind of habitat? Game species or neotropical songbirds? Early successional or old-growth forests? Edge or interior species? Even if the landowner omits financial return as a secondary objective, the easiest way to create the desired habitat may be to thin a young stand, and it would be helpful if the proceeds from sale of the thinning could pay for the cost of cutting. This could apply to public as well as private land. .

A landowner's objectives shape what is desired but other factors shape what is feasible. Matching species to site is probably the most important decision that will be made. A landowner may wish to establish cherrybark oak, but if the site has poorly drained, heavy clay soils then this is not the correct species to plant. Technology influences feasibility of objectives and largely determines the strategy we choose. Changes in technology brought about by research will almost surely change some of our strategies in the future. Interacting with all these factors is the issue of available resources -- can we afford it? Will planting stock be available? Can we get a good quality planting job done?

## Strategies

The strategies used to restore bottomland hardwood ecosystems cover a spectrum, ranging from extensive to intensive. An extensive strategy has been pursued on public land. It is to seek the lowest cost per acre, and usually involves widely-spaced plantings of heavy-seeded species of value to wildlife for hardmast. This is accomplished using bare-root seedlings or direct-seeding acorns. The idea is to establish those heavy-seeded species such as the oaks that are hardest to establish. These species provide hardmast, and the manager then relies on natural invasion through wind and water dispersal of light-seeded species. The light-seeded species are needed not only to provide diversity but also to fill in the space between the oaks in order to fully occupy the site..

More intensive strategies are available that cost more. The idea of the intensive strategy is to establish a closed canopy forest sooner, and allow the structure and composition of the future stand to be shaped by direct intervention by the manager. This also provides the potential for income to the landowner. Intensive strategies involve planting more seedlings per acre, or employing more intensive site preparation or subsequent weed control. Even more intensive approaches involve establishing multispecies stands. One example is to interplant two or more species such as cottonwood and Nuttall oak.

We believe the more intensive strategy will have multiple benefits. In addition to providing future income to the landowner, natural succession and invasion by other species will be accelerated simply by having a closed canopy forest sooner. This will be more attractive and bird and mammal vectors of heavy seeds as well as light seeds. If a closed canopy stand is established sooner, other wetland functions will be restored to levels typical of closed forest, rather than an open beanfield. Future options to manipulate stand structure abound. In the cottonwood and Nuttall oak interplanting, we have the option to harvest all the cottonwood at age 10 in the summer (in order to reduce coppice regrowth, thereby completely releasing the 8-year-old oak stand); harvest in the winter and encourage another 10-year cottonwood pulpwood rotation from coppice; or partially harvest the cottonwood at age 10, retaining a few individuals for future sawlog or den trees. In any case, the amount of coarse woody debris falling to the forest floor from shed cottonwood limbs in the first 10 years will be tremendous.

## Techniques

Restoration in the lower Mississippi Valley relies on native species planted mostly in single-species plantations of oak at wide spacing, to allow natural invasion of other species. Sites that do not flood frequently, or are more than 100 yards from existing seed sources, may not seed in successfully. We question the appropriateness of this strategy on private land on two counts. First, a more intensive approach would provide a more diverse stand and landscape quicker. This approach is inappropriate if the landowner wants to produce timber. Scant provision has been made on private or public land for future management. Wildlife managers believe the low cost, extensive strategy described above will meet their objectives. They will have few opportunities, however, for manipulating these understocked stands in the future to further enhance wildlife habitat. Private landowners will find that the stocking that results from federal cost share programs as presently formulated will not be sufficient to support a commercial pulpwood thinning even at age 20 or 30.

## **Conclusion**

The potential for restoration of bottomland hardwood ecosystems to the Delta Region has barely been tapped. If current funding levels are maintained, close to 500,000 acres could be restored over the next decade. The bulk of this will be on private land enrolled in the Wetlands Reserve Program. All restoration goals can be simplified into one immediate goal -- to re-establish closed canopy bottomland hardwood forests. Although some argue that this is incomplete restoration, all our efforts have gone into getting trees into the ground. We have argued that clearer objectives are needed that specify the future stand conditions that are desired. This will allow a more rational choice of strategy and methods that will work.